

OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **FOREST LAKE, WHITEFIELD** the program coordinators recommend the following actions. *We would like to encourage the association to conduct more sampling events in the future. With a limited amount of data it is difficult to determine lake quality trends. Since weather patterns and activity in the watershed can change throughout the summer it is a good idea to sample the lake several times over the course of the season.*

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show *highly variable* in-lake chlorophyll-a readings. By increasing the sampling program, more data can be collected, which makes understanding the lake quality trends much easier. The chlorophyll-a concentration this season was the highest the lake has experienced in six years, yet it remained below the state mean. The increase in rainfall this season likely caused an increase in nutrients entering the lake, which can cause algae to grow. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.
- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *generally stable* trend in lake transparency. Transparency decreased this year as a result of the increase in chlorophyll-a concentrations, as well as the breezy conditions at the time of viewing. The clarity reading was below the state mean for only the second time since Forest Lake joined VLAP in 1989. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last

year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.

- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. The upper graph shows a *stable* trend for epilimnetic phosphorus levels, while the lower graph shows a *general improving* trend for hypolimnetic phosphorus levels. Maintaining healthy phosphorus levels in the lake will help to keep algal concentrations down, and will promote a healthy lake environment. The concentrations in both layers were below the state median for total phosphorus. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- This summer we tested the North Inlet for Iron and Chloride. The Chloride level was 4 mg/L, which is the same as the median for lakes in New Hampshire. The Iron level was 0.579 mg/L. Iron is a nuisance to homeowners because it stains water fixtures and appears in chlorine-bleached water. We wanted to also collect a sample at the State Beach Brook, but it was stagnant and very shallow, and we didn't want to spend the association's money on a test that might not produce accurate results.
- A plankton sample was not collected this summer. We will conduct this test next summer.
- Conductivity was slightly elevated throughout most of the watershed this summer (Table 6). The excess rains may have washed pollutants into the waters. Conductivity can be influenced by human activities such as road runoff and septic system failures. The levels of conductivity around Forest Lake have remained very low since Forest Lake joined VLAP.
- The Outlet had a total phosphorus reading much lower than in previous years (Table 8). While we cannot speculate that the quality has improved, since only one sample was collected, this is a promising sign.

- Dissolved oxygen was high at all depths of the lake (Table 9). Shallow lakes, such as Forest Lake, tend to have higher oxygen levels. The lake is continuously mixing due to wind and wave action. We expect this trend to continue.
- *E. coli* originates in the intestines of warm-blooded animals (including humans) and is an indicator of associated and potentially harmful pathogens. Bacteria concentrations were low at the sites tested (Table 12). If residents are concerned about septic system impacts, testing when the water table is high or after rains is best. Please consult the Other Monitoring Parameters section of the report for the current standards for *E. coli* in surface waters.

NOTES

- Monitor's Note (8/29/00): State Beach Brook stagnant.

USEFUL RESOURCES

Weed Watchers: An Association to Halt the Spread of Exotic Aquatic Plants, WD-BB-4, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Through the Looking Glass: A Field Guide to Aquatic Plants. North American Lake Management Society, 1988. (608) 233-2836 or www.nalms.org

Riparian Buffers. Connecticut River Joint Commissions fact sheet. (603) 826-4800.

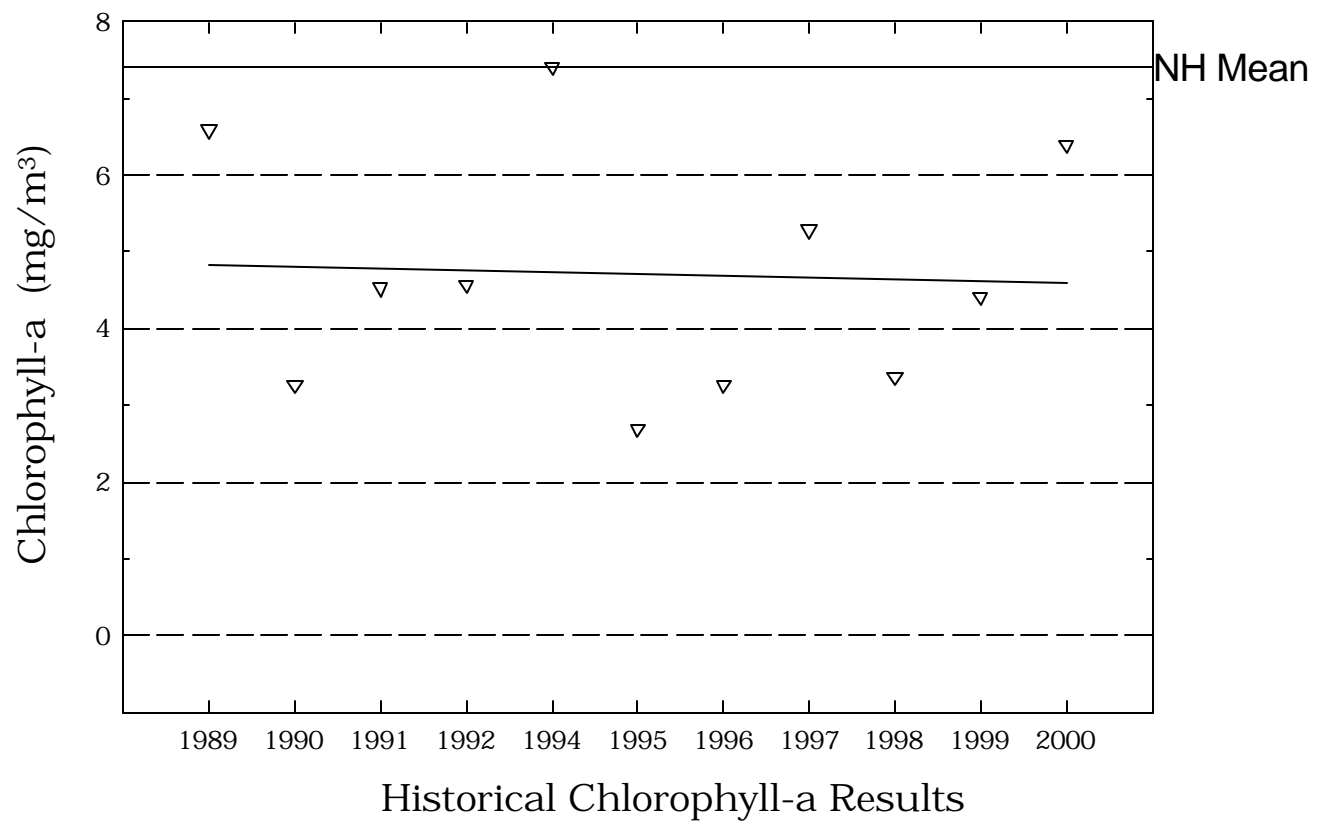
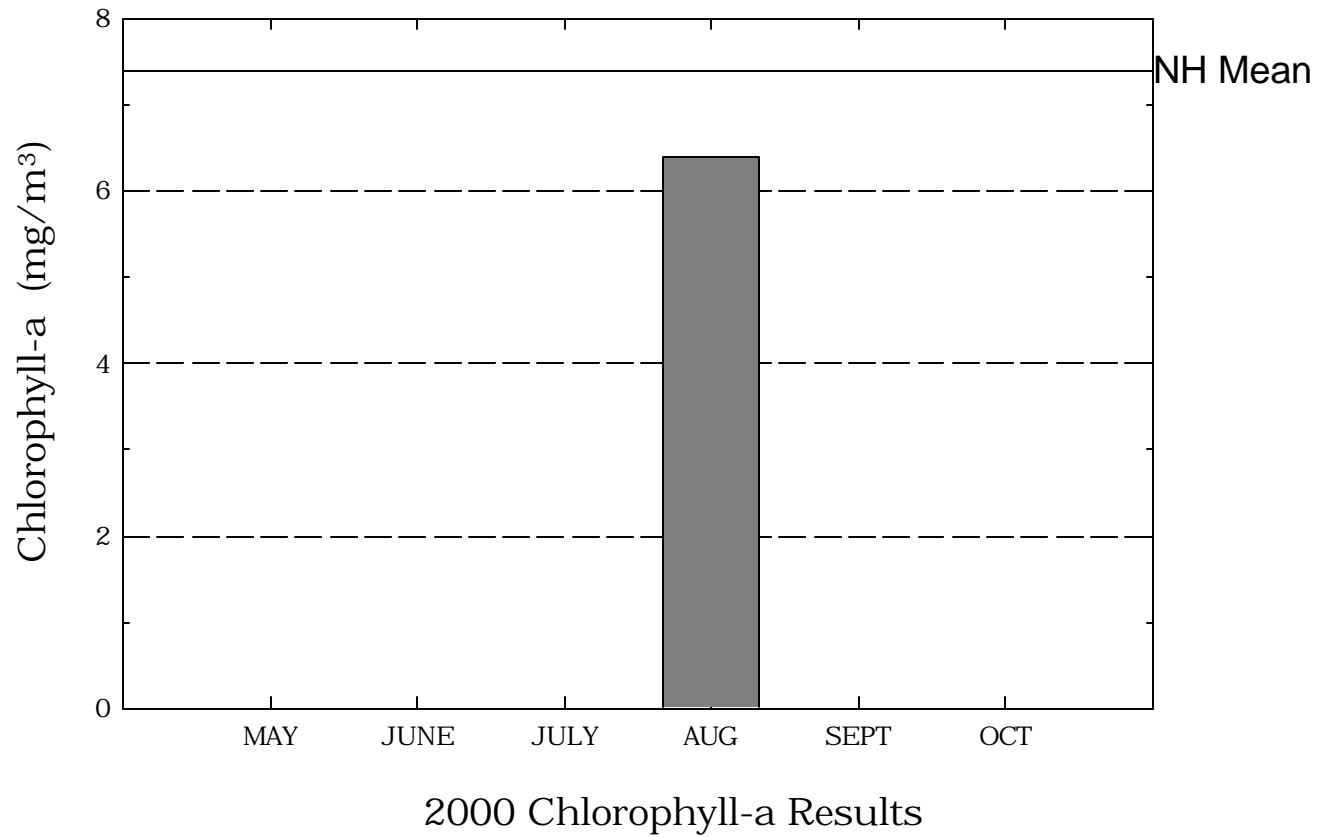
Save Our Streams Handbook for Wetlands Conservation and Sustainability. (800) BUG-IWLA, or visit www.iwla.org

Bacteria in Surface Waters, WD-BB-14, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

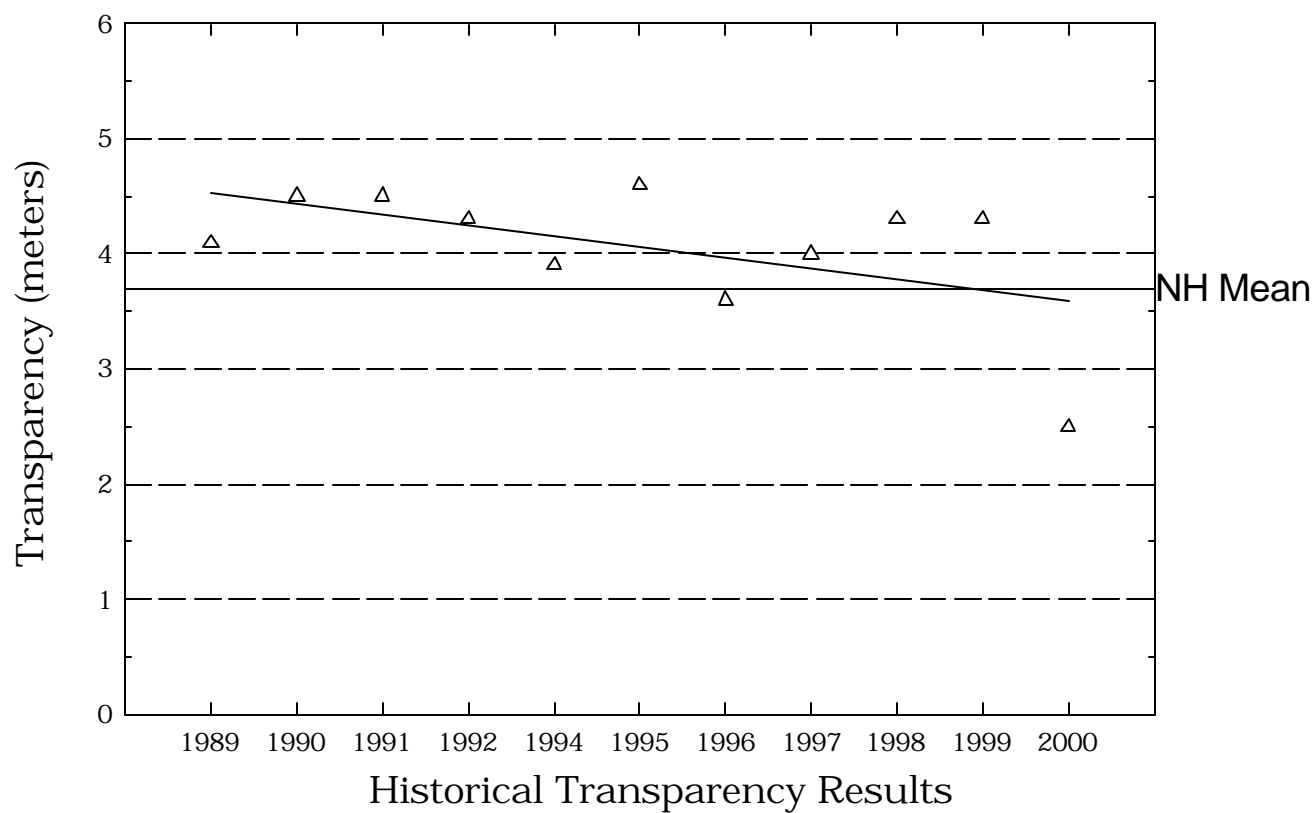
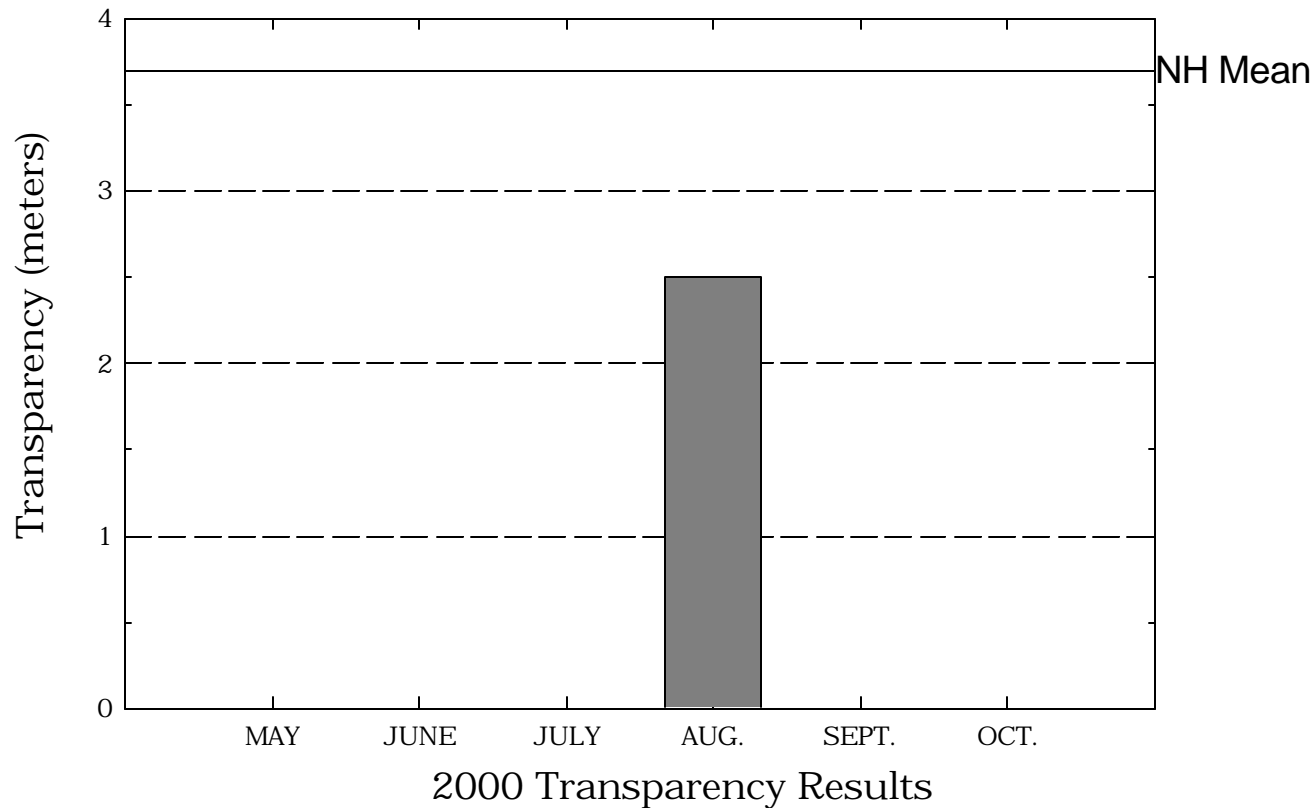
Forest Lake, Whitefield

Figure 1. Monthly and Historical Chlorophyll-a Results



Forest Lake, Whitefield

Figure 2. Monthly and Historical Transparency Results



Forest Lake, Whitefield

Figure 3. Monthly and Historical Total Phosphorus Data.

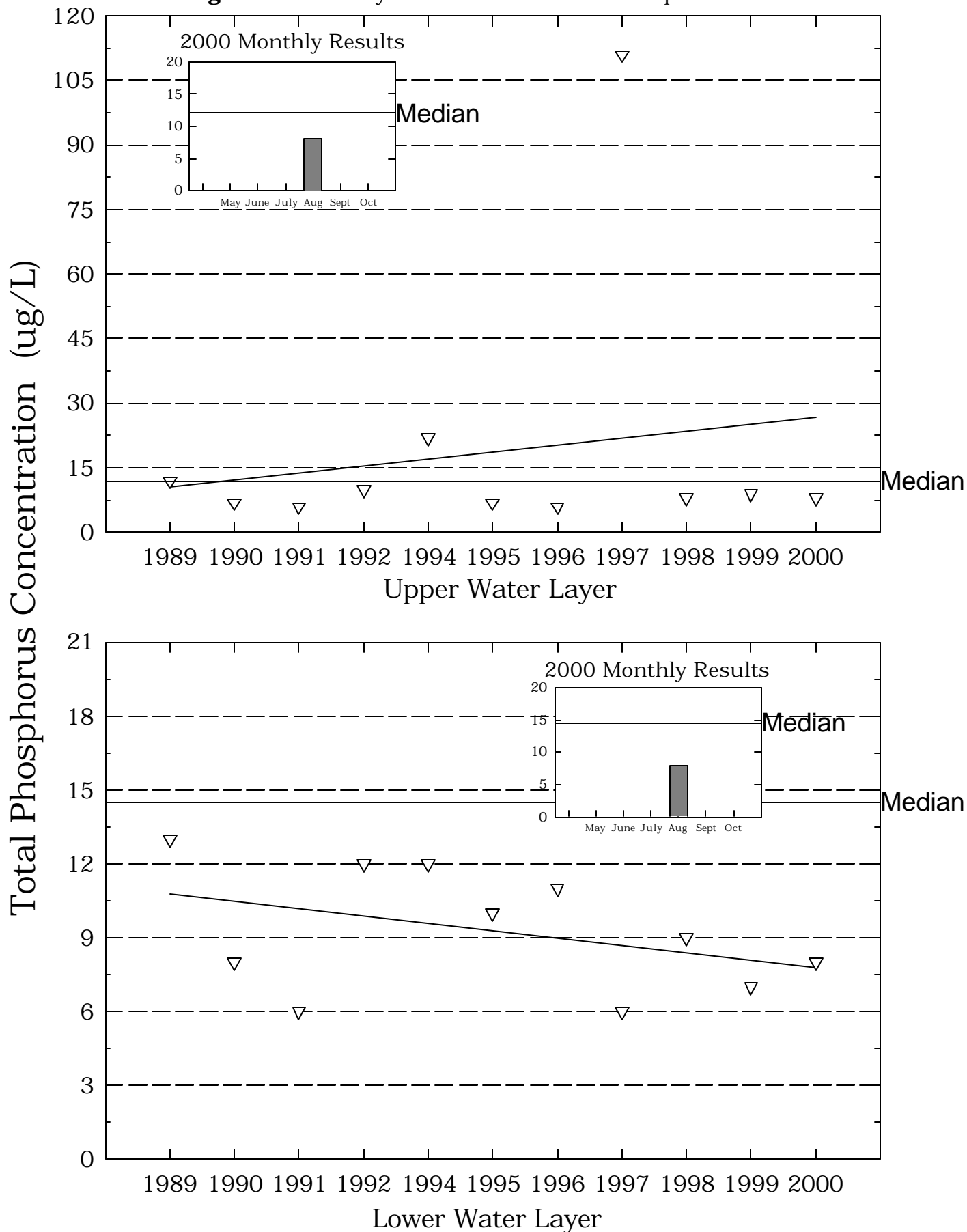


Table 1.**FOREST LAKE
WHITEFIELD****Chlorophyll-a results (mg/m³) for current year and historical
sampling periods.**

Year	Minimum	Maximum	Mean
1989	6.59	6.59	6.59
1990	3.27	3.27	3.27
1991	4.53	4.53	4.53
1992	4.57	4.57	4.57
1994	7.42	7.42	7.42
1995	2.70	2.70	2.70
1996	3.27	3.27	3.27
1997	5.29	5.29	5.29
1998	3.37	3.37	3.37
1999	4.41	4.41	4.41
2000	6.40	6.40	6.40

Table 2.

**FOREST LAKE
WHITEFIELD**

Phytoplankton species and relative percent abundance.

Summary for current and historical sampling seasons.

Date of Sample	Species Observed	Relative % Abundance
09/06/1989	CHRYSOSPHAERELLA	46
	ASTERIONELLA	
	DINOBRYON	
08/22/1991	ASTERIONELLA	53
	CHRYSOSPHAELLA	34
08/04/1992	DINOBRYON	54
	ASTERIONELLA	42
07/28/1994	CHRYSOSPHAERELLA	45
	RHIZOLENIA	20
	STAUSTRUM	10
08/08/1995	ASTERIONELLA	34
	SPHAEROCYSTIS	19
	DINOBRYON	13
08/08/1996	ASTERIONELLA	41
	SYNURA	38
	DINOBRYON	26
08/26/1997	DINOBRYON	65
	MICROCYSTIS	12
	SPHAEROCYSTIS	5
07/29/1998	TABELLARIA	34
	DINOBRYON	18
	ANABAENA	13

Table 3.**FOREST LAKE
WHITEFIELD****Summary of current and historical Secchi Disk
transparency results (in meters).**

Year	Minimum	Maximum	Mean
1989	4.1	4.1	4.1
1990	4.5	4.5	4.5
1991	4.5	4.5	4.5
1992	4.3	4.3	4.3
1994	3.9	3.9	3.9
1995	4.6	4.6	4.6
1996	3.6	3.6	3.6
1997	4.0	4.0	4.0
1998	4.3	4.3	4.3
1999	4.3	4.3	4.3
2000	2.5	2.5	2.5

Table 4.

**FOREST LAKE
WHITEFIELD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
BIBLE CAMP				
	1996	6.84	6.84	6.84
EPILIMNION				
	1990	7.02	7.02	7.02
	1991	6.80	6.80	6.80
	1992	7.05	7.05	7.05
	1994	6.96	6.96	6.96
	1995	6.94	6.94	6.94
	1996	6.81	6.81	6.81
	1997	7.13	7.13	7.13
	1998	6.44	6.44	6.44
	1999	6.59	6.59	6.59
	2000	6.95	6.95	6.95
HYPOLIMNION				
	1989	7.01	7.01	7.01
	1990	6.87	6.87	6.87
	1991	6.80	6.80	6.80
	1992	6.78	6.78	6.78
	1994	6.85	6.85	6.85
	1995	6.88	6.88	6.88
	1996	6.76	6.76	6.76
	1997	6.86	6.86	6.86
	1998	6.21	6.21	6.21
	1999	6.53	6.53	6.53
	2000	6.90	6.90	6.90

Table 4.**FOREST LAKE
WHITEFIELD**

pH summary for current and historical sampling seasons.
Values in units, listed by station and year.

Station	Year	Minimum	Maximum	Mean
NORTH INLET	1989	6.71	6.71	6.71
	1990	7.17	7.17	7.17
	1991	6.80	6.80	6.80
	1992	6.91	6.91	6.91
	1994	6.75	6.75	6.75
	1995	6.81	6.81	6.81
	1996	6.85	6.85	6.85
	1998	6.68	6.68	6.68
	1999	6.73	6.73	6.73
	2000	6.69	6.69	6.69
OUTLET	1989	6.90	6.90	6.90
	1990	7.17	7.17	7.17
	1991	6.90	6.90	6.90
	1992	6.98	6.98	6.98
	1994	6.96	6.96	6.96
	1995	6.94	6.94	6.94
	1996	6.69	6.69	6.69
	1997	7.17	7.17	7.17
	1998	6.86	6.86	6.86
	1999	6.83	6.83	6.83
STATE BEACH BROOK	2000	7.03	7.03	7.03
	1989	6.48	6.48	6.48
	1990	5.97	5.97	5.97
	1991	6.20	6.20	6.20

Table 4.

**FOREST LAKE
WHITEFIELD**

**pH summary for current and historical sampling seasons.
Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
	1994	6.55	6.55	6.55
	1995	6.30	6.30	6.30
	1996	6.41	6.41	6.41
	1997	6.35	6.35	6.35
	1998	6.54	6.54	6.54
	1999	6.59	6.59	6.59

Table 5.**FOREST LAKE****WHITEFIELD****Summary of current and historical Acid Neutralizing Capacity.****Values expressed in mg/L as CaCO₃.****Epilimnetic Values**

Year	Minimum	Maximum	Mean
1989	6.80	6.80	6.80
1990	5.40	5.40	5.40
1991	5.90	5.90	5.90
1992	7.10	7.10	7.10
1994	6.30	6.30	6.30
1995	7.00	7.00	7.00
1996	6.60	6.60	6.60
1997	6.30	6.30	6.30
1998	6.80	6.80	6.80
1999	7.60	7.60	7.60
2000	7.90	7.90	7.90

Table 6.

**FOREST LAKE
WHITEFIELD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
BIBLE CAMP				
	1996	44.3	44.3	44.3
EPILIMNION				
	1989	44.1	44.1	44.1
	1990	42.1	42.1	42.1
	1991	42.2	42.2	42.2
	1992	41.1	41.1	41.1
	1994	41.0	41.0	41.0
	1995	40.8	40.8	40.8
	1996	38.8	38.8	38.8
	1997	36.5	36.5	36.5
	1998	36.3	36.3	36.3
	1999	39.1	39.1	39.1
	2000	41.5	41.5	41.5
HYPOLIMNION				
	1989	44.1	44.1	44.1
	1990	42.1	42.1	42.1
	1991	41.6	41.6	41.6
	1992	40.8	40.8	40.8
	1994	41.6	41.6	41.6
	1995	24.6	24.6	24.6
	1996	38.6	38.6	38.6
	1997	36.7	36.7	36.7
	1998	36.1	36.1	36.1
	1999	39.0	39.0	39.0
	2000	41.3	41.3	41.3

Table 6.

**FOREST LAKE
WHITEFIELD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
NORTH INLET	1989	64.2	64.2	64.2
	1990	56.5	56.5	56.5
	1991	71.6	71.6	71.6
	1992	67.1	67.1	67.1
	1994	87.7	87.7	87.7
	1995	58.4	58.4	58.4
	1996	48.9	48.9	48.9
	1998	56.7	56.7	56.7
	1999	75.5	75.5	75.5
	2000	71.7	71.7	71.7
OUTLET	1989	43.8	43.8	43.8
	1990	41.6	41.6	41.6
	1991	49.5	49.5	49.5
	1992	41.1	41.1	41.1
	1994	42.0	42.0	42.0
	1995	40.9	40.9	40.9
	1996	38.1	38.1	38.1
	1997	36.4	36.4	36.4
	1998	36.4	36.4	36.4
	1999	39.4	39.4	39.4
	2000	41.2	41.2	41.2
STATE BEACH BROOK	1989	49.8	49.8	49.8
	1990	126.2	126.2	126.2
	1991	65.8	65.8	65.8

Table 6.

**FOREST LAKE
WHITEFIELD**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
	1994	115.8	115.8	115.8
	1995	45.9	45.9	45.9
	1996	43.8	43.8	43.8
	1997	40.8	40.8	40.8
	1998	63.7	63.7	63.7
	1999	73.0	73.0	73.0

Table 8.

**FOREST LAKE
WHITEFIELD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
BIBLE CAMP	1996	7	7	7
EPILIMNION	1989	12	12	12
	1990	7	7	7
	1991	6	6	6
	1992	10	10	10
	1994	22	22	22
	1995	7	7	7
	1996	6	6	6
	1997	111	111	111
	1998	8	8	8
	1999	9	9	9
	2000	8	8	8
HYPOLIMNION	1989	13	13	13
	1990	8	8	8
	1991	6	6	6
	1992	12	12	12
	1994	12	12	12
	1995	10	10	10
	1996	11	11	11
	1997	6	6	6
	1998	9	9	9
	1999	7	7	7
	2000	8	8	8

Table 8.**FOREST LAKE
WHITEFIELD****Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
NORTH INLET	1989	9	9	9
	1990	15	15	15
	1991	6	6	6
	1992	11	11	11
	1994	55	55	55
	1995	253	253	253
	1996	10	10	10
	1998	20	20	20
	1999	15	15	15
	2000	5	5	5
OUTLET	1989	12	12	12
	1990	11	11	11
	1991	8	8	8
	1992	9	9	9
	1994	24	24	24
	1995	5	5	5
	1996	9	9	9
	1997	9	9	9
	1998	9	9	9
	1999	4	4	4
STATE BEACH BROOK	2000	9	9	9
	1989	15	15	15
	1990	154	154	154
	1991	23	23	23

Table 8.

**FOREST LAKE
WHITEFIELD**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
	1994	93	93	93
	1995	16	16	16
	1996	23	23	23
	1997	24	24	24
	1998	48	48	48
	1999	65	65	65

Table 9.
FOREST LAKE
WHITEFIELD

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
August 29, 2000			
0.1	21.4	8.6	96.7
1.0	20.9	8.5	94.6
2.0	20.7	8.2	91.7
3.0	20.7	8.2	90.9
4.0	20.5	7.7	85.2
4.5	20.3	5.7	63.2

Table 10.**FOREST LAKE
WHITEFIELD****Historic Hypolimnetic dissolved oxygen and temperature data.**

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
September 16, 1989	5.0	19.0	9.4	101.0
August 29, 1990	5.4	20.1	0.0	0.0
August 22, 1991	5.0	21.1	8.4	95.0
August 4, 1992	5.0	19.9	8.0	88.3
July 28, 1994	5.0	22.5	2.3	26.0
August 8, 1995	5.0	23.2	7.0	82.0
August 8, 1996	5.5	19.9	0.2	2.0
August 26, 1997	5.0	20.0	8.4	91.0
July 29, 1998	5.0	23.2	8.2	95.0
August 5, 1999	5.0	23.5	7.5	88.6
August 29, 2000	4.5	20.3	5.7	63.2

Table 11.**FOREST LAKE
WHITEFIELD****Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
EPILIMNION	1997	0.4	0.4	0.4
	1998	0.4	0.4	0.4
	1999	0.3	0.3	0.3
	2000	0.5	0.5	0.5
HYPOLIMNION	1997	0.4	0.4	0.4
	1998	0.4	0.4	0.4
	1999	0.3	0.3	0.3
	2000	0.5	0.5	0.5
NORTH INLET	1998	2.3	2.3	2.3
	1999	2.1	2.1	2.1
	2000	1.4	1.4	1.4
OUTLET	1997	0.5	0.5	0.5
	1998	0.5	0.5	0.5
	1999	0.4	0.4	0.4
	2000	0.4	0.4	0.4
STATE BEACH BROOK	1997	1.8	1.8	1.8
	1998	5.1	5.1	5.1
	1999	9.2	9.2	9.2

Table 12.

**FOREST LAKE
WHITEFIELD**

**Summary of current year bacteria sampling.
Results in counts per 100ml.**

Location	Date	E. Coli
		See Note Below
#1	August 29	3
#2	August 29	2
#3	August 29	1
#4	August 29	0